

## CALCULATING BEER COLOR by Mike Retzlaff

SRM (Standard Reference Method) is the normal scale used as a measurement of beer color. SRM does not deal with beer color in the sense of it being red, brown, black, amber, or straw. It measures the density of the coloring agents in the liquid as resistance to light passing through the beer (light absorption). SRM is based on the old Lovibond rating for color and the two can be considered equal for our purposes as home-brewers.

EBC (European Brewery Convention) is another scale which is often seen. The old formula used to convert EBC to SRM was:

$$\text{EBC} = 2.65 \times \text{SRM} - 1.2$$

$$\text{SRM} = 0.377 \times \text{EBC} + 0.45$$

In recent years, EBC changed the wave length of light used for measurement to equal that used by the American Society of Brewing Chemists (ASBC) who adopted SRM in 1950 and now the conversion is:

$$\text{EBC} = \text{SRM} \times 1.97$$

$$\text{SRM} = \text{EBC} \times .508$$

In my years of brewing, I've had to overcome my own ignorance and the confusion it produced. I would formulate a new recipe and try to predict the color of that beer through conventional wisdom. However, conventional wisdom is not always correct. It is just what some people have decided to believe and others don't question. Lighter colored beers were nearly what I had predicted but darker beers were way off . . . again, I was confused.

As an example, let's plan a recipe using 5# of Munich 10, 3# of 2 row base malt @ 1.8 °L, and 8oz. of Biscuit malt @ 23 °L. The conventional calculations would be:

$$5 \times 10 = 50$$

$$3 \times 1.8 = 5.4$$

$$0.5 \times 23 = \underline{11.5}$$

$$\text{Total } 66.9 \text{ divided by 5 gallons} = 13.38 \text{ SRM}$$

This is a fine example of good logic and mathematics but it's wrong. The beer will have a color of approximately 8.84 SRM. This is because beer color is not measured on a linear scale. The darker the formulation, the farther the calculations diverge from the actual results.

After researching this for some time, I've found that the best home-brewing color calculations we can do are in accordance with Morey's formula. In the case of our recipe, we would calculate:  **$(66.9 / 5)^{0.6859} \times 1.4922$**  (That is a caret in the formula which compensates for the non-linear function of color density.) The formula is supposed to be reasonably accurate up to about 50 SRM. I purchased a film strip with a gradient of color samples and Morey's formula gives me results consistent with this "standard."

I'm told (but cannot attest) that a few brewing software programs already use Morey's formula but this little article shows you what's going on in those behind-the-scenes calculations.

I set up an Excel spreadsheet with a listing of most of the malts and grains that I use or might use. I assigned a Lovibond rating to each as per the malters' specifications. My formula is:

$$=(\text{I136}/\text{B6})^{0.6859} * 1.4922$$

Cell I136 is the total color contribution of whatever ingredients I've selected. Cell B6 is the gallons delivered to the primary. These cell numbers are what I've got on my sheet; your mileage may vary.

It takes a little effort to set it up, but once done, it is a simple method and I can accurately estimate the color of nearly any beer I might wish to brew. If you're trying to brew to BJCP or BA guidelines, this method will help get you there.